9-6650-212-12

TM 9-6650-212-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL

TELESCOPE, OBSERVATION: M49, W/E

(6650-530-0960)

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

OCTOBER 1969

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TM 9-6650-212-12
C 1

Change No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *20 April 1973*

Operator's and Organizational Maintenance Manual
TELESCOPE, OBSERVATION: M49, W/E
(6650-530-0960)

TM 9-6650-212-12, 9 October 1969 is changed as follows:
Page B-2, section II. Basic Issue Items List is superseded as follows:

Section II. BASIC ISSUE ITEMS LIST

(1) Source Maint and Recov Code (a) Source	(b) Maint	(c) Recov	(2) Federal Stock No	(3) Description Reference Number & Mfr Code — Usable on Code	(4) Unit of Meas	(5) Qty Inc in Unit	(6) Qty Furn With Equip	(7) Illustration (a) Fig No	(b) Item No.
P-C			6650-310-2534	CASE, CARRYING M42A1 (for tripod) 8244518 (19200)	ea	1	1	2-2	
P-C			6650-871-2970	CASE, TELESCOPE M164 (for telescope) 8270828 (19200)	ea	1	1	2-2	
P-C			1240-654-3811	TRIPOD M15 6543811 (19200)	ea	1	1	2-1	

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-41 (qty rqr block No. 144) Operator's Maintenance requirements for Telescope, Observation: M49.

TM 9-6650-212-12
C 2

CHANGE
NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 27 February 1974

Operator's and Organizational Maintenance Manual
TELESCOPE, OBSERVATION: M49, W/E
(6650-530-0960)

TM 9-6650-212-12, 9 October 1969, is changed as follows:

Page ii. Change B and C under APPENDIX to read as follows:

B. BASIC ISSUE ITEMS LIST ITEMS TROOP INSTALLED OR AUTHORIZED LIST B-1
C. MAINTENANCE ALLOCATION CHART C-1

Page 1-1. Paragraph 1-2*b*, is superseded as follows:

b. Reporting of Equipment Publication Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, Frankford Arsenal, ATTN: SARFA-MA, Philadelphia, Pa 19137.

Page B-1. Appendix B. Change the title to read as follows:

Basic Issue Items List and Items Troop Installed or Authorized List

Paragraph B-1 is superseded as follows:

This manual lists basic issue items; items troop installed or authroized; and associated equipment required for installation, operation, or operator's maintenance of the observation telescope.

Paragraph B-2 is superseded as follows:

This basic issue items list and items troop installed or authorized list is divided into the following sections.

a. Basic Issue Items List — Section II. A list in alphabetical sequence, of items which are furnished with and which must be turned in with the end item.

b. Items Troop Installed or Authorized List — Section III. Not applicable.

Page B-2. Delete item 3, columns (1), (2), (3), (4), (5), and (6).

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Distribution:

To be distributed in accordance with DA Form 12-41 (qty rqr block No. 144) Operator Maintenance Requirements for Telescrope, Observation.

TECHNICAL MANUAL
No. 9-6650-212-12

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *9 October 1969*

TELESCOPE, OBSERVATION: M49, W/E (6650-530-0960)

			Paragraphs	Pages
CHAPTER 1.		INTRODUCTION		
Section	I.	General		
		Scope	1-1	1-1
		Forms, records and reports	1-2	1-1
	II.	Description and Data		
		Description of telescope	1-3	1-1
		Description of associated equipment	1-4	1-1
		Tabulated data	1-5	1-2
		Identification plate	1-6	1-2
CHAPTER 2.		OPERATING INSTRUCTIONS		
Section	I.	Controls		
		General	2-1	2-1
		Telescope M49	2-2	2-1
		Tripod M15	2-3	2-1
	II.	Operation Under Usual Conditions		
		General	2-4	2-1
		Care in handling	2-5	2-1
		Preparation for use	2-6	2-1
		Operation	2-7	2-4
	III.	Operation Under Unusual Conditions		
		General	2-8	2-4
		Operation in extreme cold weather	2-9	2-4
		Operation in extreme heat or under excessively sandy or dusty conditions	2-10	2-4
		Operation in excessively moist or salty atmosphere	2-11	2-5
CHAPTER 3.		MAINTENANCE INSTRUCTIONS		
Section	I.	Service Upon Receipt of Materiel		
		General	3-1	3-1
		Duties	3-2	3-1
		Services	3-3	3-1
	II.	Repair Parts, Tools and Equipment for Operation and Organizational Maintenance		
		General	3-4	3-1
		Repair parts	3-5	3-1
		Common tools and equipment	3-6	3-1
		Special tools and equipment	3-7	3-1
	III.	Lubrication and Painting		
		General lubrication instructions	3-8	3-2
		Painting	3-9	3-2
	IV.	Preventive-Maintenance Checks and Services	3-10	3-2
		General	3-11	3-2
		Cleaning	3-12	3-3
		Preventive-maintenance services		
	V.	Troubleshooting	3-13	3-4
		Scope	3-14	3-4
		Procedure		
	VI.	Repair of Telescope and Equipment	3-15	3-5
		General	3-16	3-5
		Maintenance		

* This manual supersedes TM 9-6650-212-12, 23 September 1959, including C1, 13 June 1963.

			Paragraphs	Pages
CHAPTER	4.	SHIPMENT AND ADMINISTRATIVE STORAGE AND DEMOLITION TO PREVENT ENEMY USE		
Section	I.	Shipment and Administrative Storage		
		Shipping instructions	4-1	4-1
		Preservation, packaging, packing and marking instructions	4-2	4-1
		Administrative storage	4-3	4-1
		Loading and blocking instructions	4-4	4-2
	II.	Destruction of Materiel to Prevent Enemy Use		
		General	4-5	4-2
		Destruction of the telescope	4-6	4-3
APPENDIX	A.	REFERENCES		A-1
	B.	MAINTENANCE ALLOCATION CHART		B-1
	C.	BASIC ISSUE ITEMS LIST		C-1

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope.

a. These instructions are for use by operator, crew or organization. They apply to telescope, observation M49 and associated equipment (6650-530-0960).

b. Appendix A contains a list of current references, including supply and technical manuals, forms and other publications applicable to the telescope and associated equipment.

c. Appendix B contains the list of basic issue items that are required for stockage by operator/crew maintenance.

d. Appendix C contains the maintenance allocation chart.

e. The procedures for administrative storage of equipment is contained in chapter 4. A portion of these procedures are in accordance with the requirements of TM 740-90-1.

f. The procedures for destruction of Army materiel to prevent enemy use is contained in chapter 4. A portion of these procedures are in accordance with the requirements of FM 5-25.

1-2. Forms, Records, and Reports.

a. Authorized Forms. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750.

b. Recommendations for Maintenance Manual Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding Officer, Frankford Arsenal, ATTN: AMSWE-SMF-W3100, Philadelphia, Pa. 19137.

c. Report of Accidents. The necessary reports are prescribed in AR 385-40.

d. Equipment Improvement Recommendations. Use the Equipment Improvement Recommendation section of DA Form 2407.

e. Materiel Failure Report. Failure of materiel will be reported in accordance with TM 38-750.

Section II. DESCRIPTION AND DATA

1-3. Description of Telescope.

a. Observation telescope M49 (fig. 1-1) is a 20-power telescope. It is characterized in its physical appearance by the offset porro-prism housing which gives the telescope its bent tube shape.

b. The telescope is used for making ground observations of a target area and effectiveness of artillery fire. Having no reticle, it has limited use.

c. The basic components are the objective assembly, body tube, prism housing assembly, and eyepiece assembly with focusing sleeve.

d. This telescope does not have an adjustable sunshade. Instead, the front end of the body tube extends approximately three-fourths of an inch beyond the objective, thereby providing a permanent sunshade. The telescope is furnished with an objective cover and an eyepiece cover cap (fig. 1-1). These are screwed into place to protect the lenses when the telescope is not in use.

1-4. Description of Associated Equipment.

a. Tripod M15. The tripod is constructed of heavy duty metal with adjustable legs and a strap made of duck cotton cloth and nylon webbing. The telescope is strapped in position in a cradle which in turn is supported on the tripod, which supports the instrument about 1-foot above the ground. The tripod provides for full rotation in

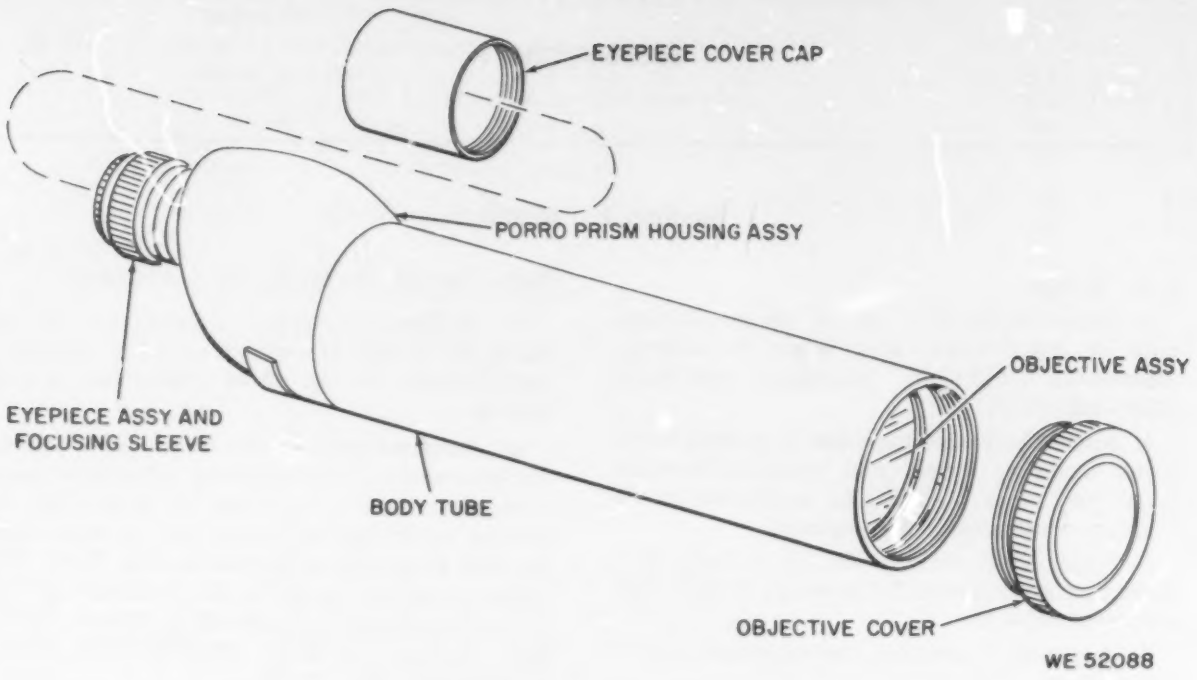

Figure 1-1. Telescope, observation M49.

azimuth of the cradle and telescope, and in conjunction with a thumbscrew for limited rotation in elevation.

b. Carrying Case M42A1. The carrying case is used for storing and transporting tripod M15. It is constructed of duck cotton cloth and nylon webbing. The case is mildew, processed and equipped with a leather strap, pads and reinforcement to protect the tripod. The letters MRT and CASE CARRYING M42A1 are stenciled on the case for identification.

c. Telescope Case M164. The carrying case is used to store or carry telescope M48 or M49 during transit. It is constructed of aluminum alloy and plastic moulding material. The case is equipped with a carrying strap and a double catch for securing the cover in closed position. A gasket is cemented to the cover to provide a waterproof seal for the case. Cellulose rubber packs are cemented at both interior ends of the case to protect the telescope from shock during handling and transit. Molded letters and figures CASE TELESCOPE M164 are used on the lid of the case for identification.

1-5. Tabulated Data.

Power of magnification	20X
Field of view	2°12′
Diameter of exit pupil	0.108 in.
E.F.L. of objective	14.211 in.
E.F.L. of eyepiece	0.716 in.
Length	14-1/2 in. (approx)
Weight	5 lb
Volume	0.3 cu. ft.

1-6. Identification Plate.

The identification plate is located on the prism housing. The plate indicates the name of the equipment, part number and serial number of the instrument.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. CONTROLS

2-1. General.

This section describes, locates, illustrates, and furnishes the operator with essential information pertaining to the various controls provided for the proper operation of telescope M49 and tripod M15.

2-2. Telescope M49.

a. Eyepiece cover cap and objective cover (fig. 1-1) must be unscrewed and removed from the telescope before it can be used. The cap and cover protect the optics when the telescope is not in use.

b. The eyepiece focusing sleeve (fig. 1-1) is turned clockwise or counterclockwise until the image can be clearly seen by the operator.

2-3. Tripod M15.

a. The height adjusting collar (fig. 2-1) is used to maintain a desired height for the telescope. The collar is held in position by securely tightening the clamping screw.

b. The shaft rotation locking thumbscrew (fig. 2-1) clamps the tripod at the desired position in azimuth.

c. The elevating thumbscrew (fig. 2-1) is used to adjust the cradle of the tripod, to increase or decrease the angle of elevation of the telescope.

d. The tripod legs can be held in an adjusted position by tightening the screw nut at the upper end of each leg.

Section II. OPERATION UNDER USUAL CONDITIONS

2-4. General.

This section contains instructions for the proper care of the materiel, preparation for operation, and the operation of observation telescope M49 and tripod M15 under conditions of moderate temperature and humidity. Every organization equipped with this telescope must thoroughly train its personnel in the procedures for operating this instrument and the tripod. For operations under unusual conditions, see paragraph 2-8 through 2-11.

2-5. Care in Handling.

The observation telescope will not stand rough handling or abuse. Inaccuracy or malfunctions will result from mistreatment. Any instrument which cannot be adjusted or corrected by the authorized procedure must be brought to the attention of maintenance personnel for necessary repairs. Adjustments other than those expressly authorized will not be performed by the operator.

a. Unnecessary turning of screws or other parts not incident to the use of the instrument is forbidden.

b. Stops are provided on instruments to limit the travel of the moving parts. Do not attempt to force the rotation of any knob beyond the stop limit.

c. Keep the instrument as clean and dry as possible. If the telescope or tripod is wet, dry it carefully.

d. When not in use, keep the equipment covered and protected from dust and moisture.

e. Do not point optical instruments directly at the sun unless a filter is used, as the heat of the focused rays may damage optical elements.

2-6. Preparation for Use.

a. Setting Up.

(1) Unfasten the tripod carrying case cover flaps and remove the tripod (fig. 2-2). The unbuckled strap of the tripod should be fastened to provide a loop 3 inches in diameter.

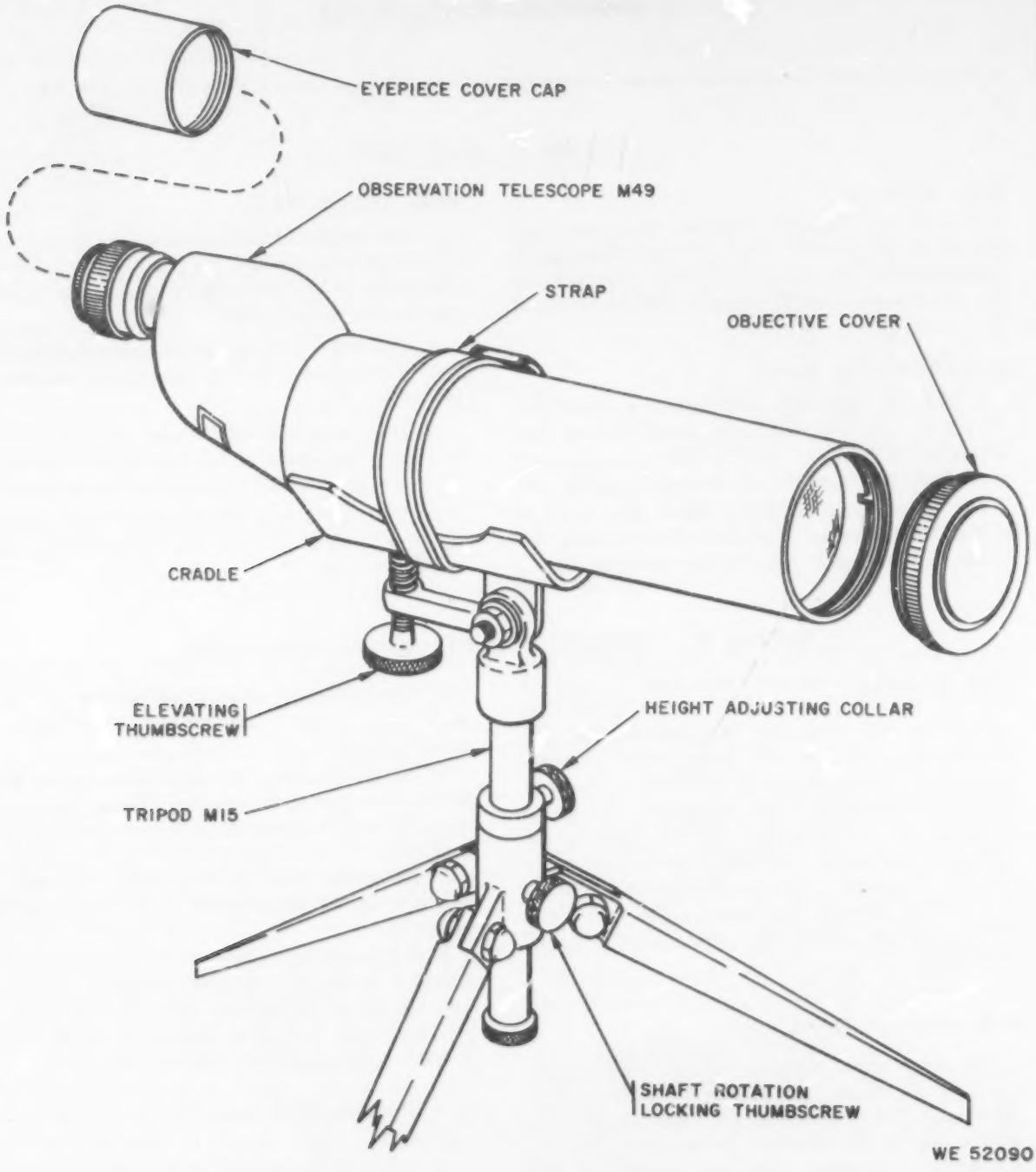

Figure 2-1. Tripod M15 with telescope, observation M49.

(2) Spread the legs and place the tripod on the ground. A level position should be sought to provide the cradle with a level line of sight with the target area.

(3) Unfasten the two catches on telescope carrying case (fig. 2–2) and lift up lid of case and remove the telescope from the carrying case.

(4) Unscrew and remove the objective cover and eyepiece cover cap (fig. 1–1). The covers may be placed in the carrying case for safe keeping while the telescope is in use. Inspect the telescope and tripod as indicated in *b* below.

(5) Place the telescope through the strap loop of the tripod and tighten the strap to prevent the telescope from rolling off the cradle and onto the ground. The telescope is now prepared for use (fig. 2–1).

b. Inspection.

(1) *General.* Whenever inaccuracies, maladjustment, or any other conditions affecting serviceability are disclosed by the inspection prescribed in table 2–1, the necessary corrective action should be taken if the maintenance required is within the scope of the using organization. If the maintenance required is beyond the scope of the using organization, the observation telescope and/or tripod should be referred to ordnance maintenance personnel.

(2) *Procedure.* Visually examine the observation telescope and tripod for completeness (fig. 2–1) and general appearance. The painted surfaces should not have bare spots, scratches exposing bare metal, or chipped or loose paint. There should be no evidence of corrosion on any part. Table 2–1 lists the inspections to be performed on the telescope and tripod.

Table 2–1. Operator's Inspection Chart For Observation Telescope M49 and Tripod M15

Point of inspection	Para or fig. No.	Accepted standard
Cap and cover	fig. 1–1	Screw on and remain in position.
Focusing mechanism	fig. 1–1	Operate smoothly and through the entire length of threads.
Optical elements	para. 3–12*b*	Free from chips, frost patterns, and dirt. Present sharp, clean image.

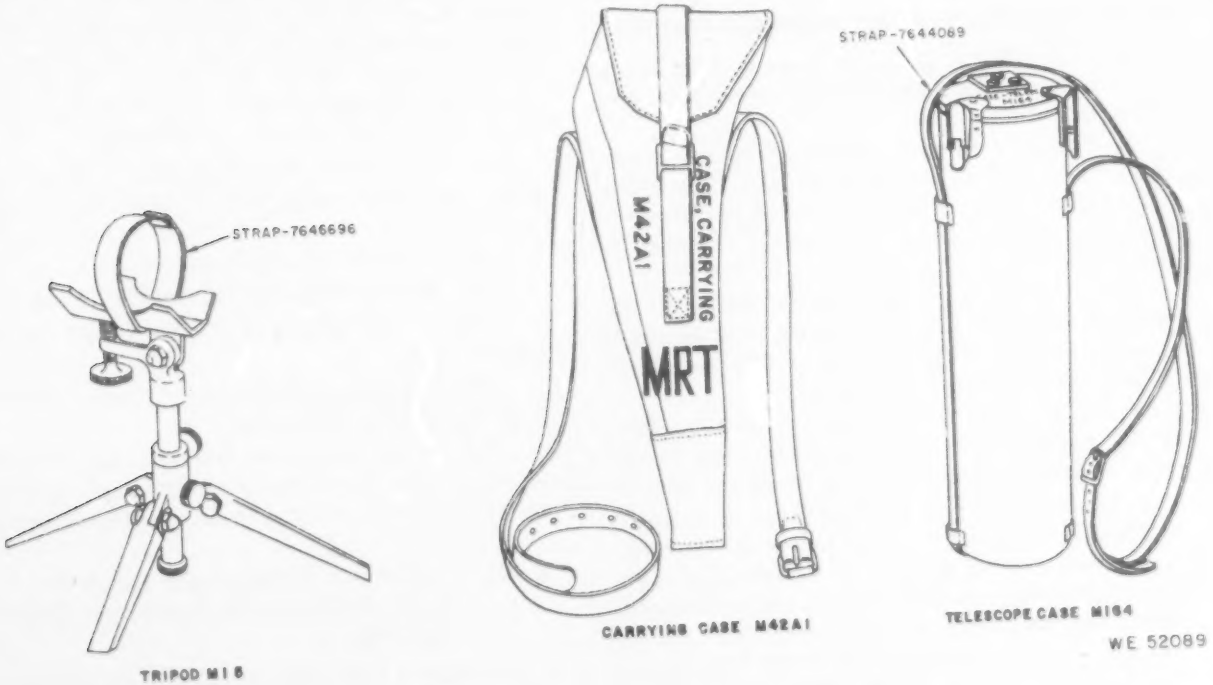

Figure 2–2. Equipment for telescope observation M49.

Table 2-1.—Continued

Point of inspection	Para or fig. No.	Accepted standard
Tripod	fig. 2-1	Legs open and close freely and the elevating thumbscrew turns without binding. Shaft rotation and height adjusting thumbscrews lock the shaft at the desired positions.

2-7. Operation.

a. With the telescope and tripod set up for operation as indicated in paragraph 2-6*a*, turn the eyepiece focusing sleeve clockwise or counterclockwise in order to get the proper focus.

b. Loosen the height adjusting collar thumbscrew and adjust the telescope for the height desired, then tighten thumbscrew.

c. Loosen the rotation locking thumbscrew on the tripod (fig. 2-1) and rotate the telescope for the azimuth area desired, then tighten thumbscrew.

d. Turn elevating thumbscrew so that telescope line-of-sight will be on target area. The telescope is now ready for observing the target area.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

2-8. General.

In addition to the normal preventive maintenance services (paras 3-10 through 3-12), special care must be observed where extremes of temperature, humidity, and atmospheric conditions are present. Proper cleaning and storage not only insure proper operation and functioning, but also guard against excessive wear of the working parts and deterioration of the materiel.

2-9. Operation in Extreme Cold Weather.

a. In temperatures below freezing, it is necessary that moving parts be kept absolutely free from moisture.

b. Excessive oil on the working parts will congeal causing sluggish operation and functioning or complete failure. This applies in particular to focusing parts. Special care should be taken to eliminate all excess oil.

c. Do not grasp metal parts, shaft, knobs, sleeves, or covers with bare hands. Use gloves if possible. Frozen fingers or loss of skin may result if this precaution is not followed.

d. Never breathe on a lens in cold weather. Frost patterns will form obscuring the image, and in extreme cases, may even break the lens.

e. Do not bring any materiel indoors unless it is absolutely necessary. It is best to leave it outdoors, but covered to protect it from the snow. Snowtight lockers which stay at outdoor temperatures are recommended as a place for keeping telescopes. If it is necessary to bring instruments from low temperatures to room temperatures, "anticondensation" containers should be used. These containers can be specially made boxes, or any other reasonably airtight container with heat-conducting walls. Keep them outside so that they will remain at prevailing temperatures until it is desired to bring an instrument indoors. Then put the instrument into the container, close the top, bring it indoors and let it come to room temperature. When the box is at room temperature, it may be opened and the instrument removed without condensation forming on it. If anticondensation chambers are not used and instruments are brought into a heated room, condensation will occur and the instruments will have to be wiped thoroughly dry. Use only lens tissue paper for drying lenses and windows.

f. Inspect instruments frequently. When possible, keep instruments in their cases. To provide maximum protection for the instruments, the following should be strictly observed:

(1) Keep instruments thoroughly clean.

(2) Do not let snow and ice collect on the instruments.

(3) Leave no metal surfaces exposed without a protective film of lubricant.

(4) Never apply heat from strongly concentrated sources directly to an instrument. Sudden changes in temperature will cause optics to break.

2-10. Operation in Extreme Heat or Under Excessively Sandy or Dusty Conditions.

a. In hot climates, the thin film of oil necessary for proper functioning will be quickly dissipated. Instruments should be inspected frequently and

returned to ordnance maintenance personnel for oiling as frequently as necessary. This will insure proper functioning as well as prevent rusting.

b. Perspiration from the hands is a contributing factor to rusting because it contains acid. After handling, instruments should be wiped dry and a film of oil restored to the metal parts.

c. Dust and sand will etch glass surfaces and penetrate the slightest openings, thereby causing possible damage to the interior parts and optics. Therefore, instruments should be kept in their cases when not in use, and when possible, stored in a warm room.

d. Do not permit dust or sand to accumulate on any of the operating parts.

e. If instruments are exposed to the direct rays of the sun, damage can result from excessive heat; also metal parts will be uncomfortable to handle. Keep instruments under cover or in shade whenever possible.

2-11. Operation in Excessively Moist or Salty Atmosphere.

a. Where humidity is high, frequently inspect instruments for rust. Remove any rust present and protect the surface with a light film of oil.

b. Salt air is conducive to quick rusting as the salt has a tendency to destroy the rust-preventive qualities of the oil. Instruments should be kept lightly lubricated (para 3-8) and inspected frequently. They should be treated in a manner similar to that prescribed in paragraph 2-10 above for operation in hot climates or under excessively sandy or dusty conditions.

c. Screws and pins of the tripod should be kept lightly oiled to prevent rusting and "freezing" in place.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

3-1. General.

a. When new, used, or reconditioned materiel is first received by the using organization, it is the responsibility of the officer in charge to determine whether the materiel has been properly prepared for service by the supplying organization and to be sure it is in condition to perform its function.

b. Make a record of any missing parts, tools, equipment, and of any malfunctions. Correct any deficiencies as quickly as possible.

3-2. Duties.

The organizational mechanic performs the inspection to determine whether the materiel has been properly prepared for service and is in condition to perform its assigned mission. It is the duty of the operator to assist the organizational mechanic in the performance of these services.

3-3. Services.

a. Unpacking and Checking. When unpacking the observation telescope (fig. 1-1) and its associated equipment (fig. 2-2), care should be exercised to prevent damage to the optical and mechanical parts, particularly when removing the instrument from the packing and crating materials.

b. Visual Inspection. Examine the telescope carefully to be sure that all component parts are present (fig. 2-1). In particular, check to see that the identification plate, objective cover, and eyepiece cover cap are present and that the telescope does not rattle when shaken.

c. Cleaning. Wipe off any excess lubricant that may have spread onto painted or optical surfaces. Clean the exposed surfaces of the optical parts, using clean lens tissue paper fastened to a length of wood dowel. Dust or lint from the packing materials may be removed from optical surfaces with a clean camel's-hair artist's brush.

Section II. REPAIR PARTS, TOOLS, AND EQUIPMENT FOR OPERATION AND ORGANIZATIONAL MAINTENANCE

3-4. General.

Repair parts, tools, and equipment are issued to the using organization for operating and maintaining the observation telescope M49, telescope case M164, carrying case M42A1 and tripod M15. Tools and equipment should not be used for purposes other than those prescribed and, when not in use, should be properly stored.

3-5. Repair Parts.

Repair parts are supplied to the using organization for replacement of those parts that become worn, broken, or otherwise unserviceable.

3-6. Common Tools and Equipment.

No standard or commonly used tools and equipment other than those originally issued to organizational personnel, are required or authorized.

3-7. Special Tools and Equipment.

No special tools and equipment are required for the observation telescope M49 and tripod M15.

Section III. LUBRICATION AND PAINTING

3-8. General Lubrication Instructions.

a. Usual Conditions. Lubrication of the observation telescope should be performed very carefully; excessive applications of a lubricant may congeal and render the close fitting parts of the telescope inoperative. Thorough cleaning of parts, before the application of any lubricant, is essential in preventing corrosive action taking place under grease or oil applications. Normally, aircraft and instrument grease will be applied to all bearing or contact surfaces which move relative to one another. The same kind of grease will be applied to all unprotected metal surfaces even though they are not working surfaces. Aircraft instrument and machine gun lubricating oil is to be used in joints and threads in leg, cradle and collar assemblies of tripod M15.

b. Reports and Records. Report unsatisfactory performance of materiel (para 1-2*e*) or unsatisfactory effect of prescribed lubricants and preserving materials.

3-9. Painting.

Organizational maintenance personnel will perform both touchup and complete paint refinishing on fire-control materiel, when required. Care will be exercised when repainting fire-control materiel to prevent paint from covering scales, lenses, bearing surfaces, telescope seats, etc., in order to maintain these and like surfaces in efficient working condition.

Section IV. PREVENTIVE-MAINTENANCE CHECKS AND SERVICES

3-10. General.

a. Responsibility and Intervals. The primary function of preventive maintenance is to prevent breakdowns and therefore, the need for repair. Preventive-maintenance services are the responsibility of the using organization. Preventive-maintenance applies generally to before-operation, during-operation, and after-operation services performed by the operator. It also applies to scheduled services to be performed at designated intervals by the organization mechanic when necessary. Intervals are based on normal operations. Shorter intervals are necessary for abnormal operation or severe conditions. Intervals during inactive periods may be lengthened as appropriate.

b. Definition of Terms. General inspection of an item includes inspection of all supporting parts and connections. It is a check to see whether the item is in good condition, correctly assembled, secure, and not excessively worn.

(1) The inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond serviceable limits. The term "good condition" is explained further as follows: not bent or twisted, not chafed or burred, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut, and not deteriorated.

(2) The inspection of a unit to see that it is "correctly assembled" is ordinarily an external inspection to see whether it is in its normal assembled position.

(3) Inspection of a unit to determine if it is "secure" is usually an external visual examination or an examination by hand or wrench for looseness. Such an examination must include lockwashers and locknuts.

(4) By "excessively worn" is meant beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection.

3-11. Cleaning.

a. General. Any special cleaning instructions required for specific mechanism or parts are contained in the pertinent section of this manual. General cleaning instructions are outlined in *b* through *g* below.

b. Metal Parts.

(1) Use dry-cleaning solvent or mineral spirits paint thinner to clean or wash grease or oil from all metal parts of the observation telescopes and tripod.

(2) After the parts are cleaned, dry them thoroughly. To prevent rusting, apply a light grade of aircraft instrument lubricating oil to all exposed unpainted machine-finished surfaces.

c. Rubber Parts. Clean rubber parts with soap and warm water. Apply coating of powdered technical talcum to preserve the rubber.

d. Leather. To clean leather, scrape off accumulations of grease and dirt with wooden instrument. Clean with leather dressing; or wash with saddle soap and water, rinsing lightly and applying neat's foot oil while still damp. Allow water-soaked items to dry in shade before commencing above process. Do not dry in direct sun or by an artificial heat source.

e. Canvas. To clean canvas, scrub with a clean dry brush or with brush and water. To remove grease and oil, scrub with saddle soap. Rinse and dry thoroughly for 24 hours. Spray or brush with approved waterproofing compound.

f. Optical Surfaces.

(1) To remove dust, lint, or other foreign matter from lenses and windows, brush the glass lightly with a clean artist's camel's-hair brush. Rap the brush against a hard body to knock out the small particles. Repeat this operation until all dust is removed.

(2) To remove oil or grease from optical surfaces when the temperature is above 32° F., breathe heavily on the glass and wipe off with clean lens tissue paper. Repeat this operation until clean.

(3) In cold weather, below 32° F., optical surfaces should be cleaned with lens tissue paper moistened with alcohol. If alcohol is not available use dry lens tissue paper. Alcohol should never be applied directly to the lens surfaces, as any excess may injure the sealing compound. Do not breathe on the glass, since this would ice the surface.

(4) Moisture due to condensation may collect on the optical elements of the instrument when the temperature of the parts is lower than that of the surrounding air. This moisture, if not excessive, can be removed by placing the instrument in a warm place. Heat from extreme concentrated sources should not be applied directly, as it may cause unequal expansion of parts, thereby resulting in damage to parts and inaccuracies of operation.

g. General Precautions in Cleaning.

(1) Dry-cleaning solvent or mineral spirits paint thinner are inflammable and should not be used near an open flame. Fire extinguishers should be provided when these materials are used. Use only in well-ventilated places.

(2) These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in the case of some individuals, mild irritation or inflammation.

(3) Avoid getting petroleum products, such as dry-cleaning solvent or mineral spirits paint thinner, engine fuels, or lubricants, on rubber parts, as they will cause the rubber to deteriorate.

(4) The use of diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.

3-12. Preventive-Maintenance Services.

a. Purpose. To insure efficient operation, it is necessary that the observation telescope be systematically inspected at intervals each day it is operated, and weekly, so that defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. Any defect or unsatisfactory operating characteristics beyond the scope of the operator or organizational mechanic to correct must be reported at the earliest opportunity to the supporting ordnance unit for correction.

b. Condition of Optics. Looking through the eyepiece and objective ends of the telescope, there will be no objectionable dirt, smears, scratches, digs, condensate, fungus growth, chips, fractures, or cement separation. The "shading or shadowing" technique will be used to determine the presence of objection condensate or smears. "Shadowing" is the technique of looking into the eyepiece or objective end of the sight obliquely so as to obtain reflections from a particular surface in the optical system. With this method; the surfaces of the internal optical elements are drab gray in appearance and all defects (condensate, scratches, etc.) show up as white particles.

Note. Rejection is to be based upon only those defects that are apparent when the telescope is used in a manner simulating field conditions. The telescope will not be rejected for defects that can be detected only by the shading or shadowing technique.

c. Services. Operator's and organizational mechanic's preventive-maintenance services are listed in table 3-1. Every organization equipped with the observation telescope M49 must thoroughly train its personnel in performing the maintenance procedures for this materiel.

Table 3-1. Preventive Maintenance Checks and Services Operator Maintenance Category

Interval and Sequence No.			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
				USUAL CONDITIONS	
		1	Observation Telescope M49	Clean and keep dry.	3-11
		2		Clean optical elements before installing cover.	3-11*f*
		3	Tripod M15	Clean and apply light film of instrument lubricating oil to hinges and mounting surfaces.	3-11*b*
		4	Telescope Case M164 and Carrying Case M42A1	Clean and keep dry.	3-11*e*
				UNUSUAL CONDITIONS—EXTREME COLD	
	5		Observation Telescope M49	Remove snow and frost on metal parts and optical elements.	3-11*f*
				EXTREME HEAT AND HUMIDITY	
6				Check for fungus growth and moisture. Report internal accumulations.	2-10, 2-11
				EXTREME DUST OR SAND	
7				Clean, remove accumulations of dust and sand.	3-11

Section V. TROUBLESHOOTING

3-13. Scope.

Troubleshooting is a systematic isolation of defective components by means of symptoms, tests for determining the defective component, plus remedies. The tests and remedies provided in this section are governed by the scope of the organizational level of maintenance.

3-14. Procedure.

The troubleshooting procedure described in table 3-2, is one of determining, upon occurrence of malfunction noted, the probable cause, then taking the necessary corrective action. This includes notifying maintenance personnel if the tests and remedies are beyond the scope of the using organization.

Table 3-2. Troubleshooting

Item No.	Malfunction	Probable causes	Corrective action
1	Loose cover or cap.	Damaged cover or cap.	Replace cover or cap.
2	No image.	Defective lenses or optics.	Notify organizational maintenance personnel.
3	Focusing sleeve fails to turn.	*a.* Dirty threads.	*a.* Clean and lubricate.
		b. Damaged threads.	*b.* Notify organizational maintenance personnel.
4	Broken or frayed strap of tripod or telescope carrying case.	Wear.	Replace tripod or carrying case.
5	Dirt inside the telescope.	Defective sealing.	Notify organizational maintenance personnel.
6	Loose tripod legs.	Loose attaching screws.	Tighten attaching screws.
7	Broken seam or stitches.	Wear.	Notify organizational maintenance personnel.

Section VI. REPAIR OF TELESCOPE AND EQUIPMENT

3-15. General.

This section contains general and specific organizational maintenance instructions for the repair of the major items and its equipment. Paragraph 3-16 covers the repairs that are within the scope of the organizational level of maintenance necessary to assure that the telescope and its equipment are in a serviceable condition.

3-16. Maintenance.

a. If damaged, unscrew the objective cover and/or eyepiece cover cap and replace them.

b. If damaged, replace telescope case M164 and/or carrying case M42A1.

c. The attaching screws for the tripod legs may be tightened with the organizational mechanic's adjustable wrench.

CHAPTER 4

SHIPMENT AND ADMINISTRATIVE STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND ADMINISTRATIVE STORAGE

4-1. Shipping Instructions.

a. Responsibility. When shipping the observation telescope M49 and equipment, the unit commander will be responsible for shipping the materiel adequately processed, packaged and packed to reach the echelon of maintenance for required repairs, and/or in a serviceable condition in the case of troop movement.

b. Army Shipping Documents. Prepare Army shipping documents accompanying freight.

c. Preparation for Shipment. Telescopes and equipment removed from administrative storage (para 4-3) for shipment need not be repackaged unless inspection reveals them to be inadequately packaged, or when it is necessary because of anticipated in-transit weather or shipping conditions. Packaging must not be removed or disturbed, except as it it necessary to insure that the telescopes and equipment will reach the echelon of maintenance for required repairs adequately processed and packaged, and/or in a serviceable condition in the case of troop movement. If packaging has been removed, materiel must be repackaged prior to shipment.

4-2. Preservation, Packaging, Packing, and Marking Instructions.

a. Preservation and Packaging. Preservation must be sufficient to protect the telescopes and equipment against deterioration and damage during shipment and administrative storage and/or the subsequent interval prior to use. Under no condition will the telescopes and equipment with critical surfaces be packaged and packed without benefit of sufficient preservatives to assure adequate protection of materiel. Preservatives must be compatible with end use requirements.

b. Packing. Packing must be acceptable to the carrier while affording adequate protection to the telescopes and equipment during shipment and administrative shortage and/or the subsequent interval prior to use.

c. Marking. All unit packages and exterior shipping containers will be marked.

4-3. Administrative Storage.

a. General.

(1) Unit commanders may, with the approval of major commanders, place telescopes and equipment that are beyond the maintenance capability of the unit in administrative storage or return them to supply agencies. Materiel must be stored in the most favorable location available, preferably in warehouses which afford protection from exposure to the elements and pilferage.

(2) All telescopes and equipment in administrative storage must be maintained so that they will be ready for immediate use and/or ready for shipment.

(3) Administrative storage is restricted to a period of 90 days and must not be extended unless the materiel is reprocessed.

b. Storage Procedure.

(1) Maintenance will consist of inspecting, cleaning, servicing, preserving, and lubricating, as required and will also include minor repair parts replacement, if required.

(2) Lubricate materiel in accordance with instructions prescribed in paragraph 3-8.

(3) Protect the telescopes with the eyepiece cover cap and objective cover provided.

(4) Provide access to the materiel to permit inspection, servicing, and removal from storage.

(5) Mark the telescopes and equipment, "Administrative Storage" (by use of tag or other convenient method).

c. Inspection in Administrative Storage. Inspection will usually be visual and must consist of at least a walk-around examination of the equipment to observe any deficiencies that may

have occurred. Inspect equipment in open storage weekly and that in covered storage monthly. Immediately after any severe storm or environmental change inspect all equipment. The following are examples of things to look for during visual inspection.

(1) Condition of preservatives, seals, and wraps.

(2) Torn, frayed, or split canvas covers and tops.

(3) Corrosion or other deterioration.

(4) Missing or damaged parts.

(5) Water in compartments.

(6) Any other readily recognizable shortcomings or deficiencies.

d. Repair During Administrative Storage. Keep equipment in an optimum state of readiness. Accomplish required services and repairs as expeditiously as possible.

e. Rotation. To assure utilization of all assigned materiel, rotate items in accordance with any rotational plan that will keep equipment in an operational condition and reduce maintenance effort.

4-4. Loading and Blocking Instructions.

Organizational maintenance personnel may assist, as required, in loading and blocking boxed equipment into boxcars and/or trucks.

Section II. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

4-5. General.

a. Destruction of the observation telescope M49 when subject to capture or abandonment in the combat zone, will be undertaken by the branch or service only when, in the judgment of the unit command concerned, such action is necessary in accordance with orders of, or policy established by, the army commander.

b. The information which follows is for guidance only. Certain portions of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items of issue to the using organization. The issue of these and related materials, and the conditions under which destruction will be effected, are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are—

Mechanical —Requires axe, pick mattock, sledge, crowbar, or similar implement.

Burning —Requires gasoline, oil, incendiary grenades, or other flammables, or welding or cutting torch.

*Demolition —Requires suitable explosives or ammunition.

*Gunfire —Includes artillery, machine guns, rifles, using rifle grenades, and launchers using antitank rockets. Under some circumstances hand grenades may be used.

Disposal —Requires burying in the ground, dumping in streams or marshes, or scattering so widely as to preclude recovery of essential parts.

In general, destruction of essential parts, followed by burning will usually be sufficient to render the materiel useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. However, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the

* Generally applicable only when the observation telescope is to be destroyed in conjunction with other equipment.

same essential parts must be destroyed on all like materiel so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction by demolition or gunfire is directed, due consideration should be given to the observance of appropriate safety precautions.

4-6. Destruction of the Telescope.

a. Method No. 1—By Mechanical Means.

(1) Remove the observation telescope and tripod from their carrying cases.

(2) Using an axe, pick mattock, sledge, or other heavy implement, destroy the observation telescope and tripod by smashing the cradle, main housing, optical elements, legs, adjusting screws, and controls. Destroy the strap by cutting it into short lengths. Elapsed time: about 3 minutes.

b. Method No. 2—By Burning.

(1) Remove the observation telescope and tripod from the carrying cases.

(2) Using a welding or cutting torch, burn the main housing, legs, cradle, adjusting screws, and controls. Also destroy the strap by burning in several places. Elapsed time: about 3 minutes.

(3) In the absence of a welding or cutting torch, place the observation telescope and tripod on a pile of combustible. Pour gasoline or oil over the combustible and over the observation telescope and tripod. Ignite and take cover. A hot fire is required to render the materiel useless.

Caution: **When igniting gasoline, due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns.**

Elapsed time: About 2 minutes.

c. Method No. 3—Disposal. Bury the observation telescope and tripod in a suitable hole or throw them into a stream.

Elapsed time: about 3 minutes

APPENDIX A

REFERENCES

A-1. Publication Indexes.

The following indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

Index of Army Films, Transparencies, GTA Charts and Recordings	DA Pam 108-1
Military Publications:	
Index of Administrative Publications	DA Pam 310-1
Index of Blank Forms	DA Pam 310-2
Index of Doctrinal, Training and Organizational Publications	DA Pam 310-3
Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins and Lubrication Orders	DA Pam 310-4
Index of Supply Catalogs and Supply Manuals (excluding types 7, 8, and 9)	DA Pam 310-6
U.S. Army Equipment Index of Modification Work Orders	DA Pam 310-7

A-2. Supply Manuals.

The following supply manual of the Department of the Army pertains to this materiel.

Telescope, Observation M48 and M49	ORD 7 SNL F-178

A-3. Forms.

DA Form 1546, Request for Issue or Turn-in.
DD Form 6, Report of Damaged or Improper Shipment.

A-4. Other Publications.

The following explanatory publications contain information pertinent to this materiel and associated equipment.

a. Camouflage.	
Camouflage, Basic Principles and Field Camouflage	FM 5-20
b. Decontamination.	
Chemical, Biological and Radiological (CBR) Decontamination	TM 3-220
Chemical, Biological and Nuclear Defense	FM 21-40
c. Destruction to Prevent Enemy Use.	
Explosives and Demolitions	FM 5-25
d. General.	
Logistics (General): Malfunctions Involving Ammunition and Explosives, (Reports Control Symbol AMC-132)	AR 700-1300-8
Military Symbols	FM 21-30
Military Terms, Abbreviations, and Symbols:	
Authorized Abbreviations and Brevity Codes	AR 320-50
Dictionary of U.S. Army Terms (short title: AD)	AR 320-5
Military Training Management	FM 21-5

Safety:	
Accident Reporting and Records	AR 385-40
Regulations for Firing Ammunition for Training, Target Practice and Combat	AR 385-63
Techniques of Military Training	FM 21-6
e. Maintenance and Repair.	
Painting Instructions for Field Use	TM 9-213
Administrative Storage of Equipment	TM 740-90-1
Operation and Maintenance of Army Materiel in Extreme Cold Weather 0° to -65°	TM 9-207
Ordnance Maintenance: Observation Telescopes M48 and M49	TM 9-1556

APPENDIX B

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. Scope.

This appendix lists items which accompany the observation telescope and associated equipment or are required for installation, operation, or operator's maintenance.

B-2. General.

This Basic Issue Items List contains the following:

a. Basic Issue Items—Section II. A list of items which accompany the telescope and associated equipment and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies. Not applicable.

B-3. Explanation of Columns.

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column 1:

(1) Source code, indicates the selection status and source for the listed item. Source codes are:

Code	*Explanation*
P	Repair parts which are stocked in or supplied from the GSA/DSA, or Army supply system, and authorized for use at indicated maintenance categories.
M	Repair parts which are not procured or stocked but are manufactured at indicated maintenance categories.
A	Assemblies which are not procured or stocked as such but are made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.
X	Parts and assemblies which are not procured or stocked; the mortality of which is normally below that of the applicable end item; and the failure of which should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked, the requirements for which will be supplied by use of the next higher assembly or component.
X2	Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
C	Repair parts authorized for local procurement. When not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.
G	Major assemblies that are procured with PEMA funds for initial issue only to be used as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above DSU and GSU level or returned to Depot supply level.

(2) Maintenance code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	*Explanation*
C	Operator/crew

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	*Explanation*
R	Repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	High dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materiels, high dollar value reusable casings, etc.
No code indicated.	Parts will be considered expendable.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description, Column 3. This column indicates the Federal item name and any additional description of the item required. The abbreviation "w/e", when used as a part of the nomenclature, indicates the Federal stock number includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses.

d. Unit of Measure (U/M), Column 4. A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit, Column 5. This column indicates the quantity of the item used in the assembly group.

f. Quantity Furnished With Equipment, Column 6. This column indicates the quantity of the item furnished with the equipment.

g. Illustration, Column 7. This column is divided as follows:

(1) *Figure Number, Column 7a.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item Number, Column 7b.* Indicates the callout number used to reference the item in the illustration.

B-4. Abbreviations.

Code	*Explanation*
w/e	with/equipment

B-5. Federal Supply Code for Manufacturers.

Code	*Explanation*
19200	Frankford Arsenal, Philadelphia, Pa. 19137.

Section II. BASIC ISSUE ITEMS

(1) SMR			(2)	(3)	(4)	(5)	(6)	(7)	
(a) source	(b) maint.	(c) recov.	Federal Stock No.	Description Reference Number & Infr. Code Usable on Code	Unit of Meas.	Qty. Inc. in Unit	Qty. Furn. with Equip.	Illustration (a) Fig. No.	Illustration (b) Item No.
---	P---	C---	6650-310-2534	CASE, CARRYING M42A1 (for tripod) 8244518 (19200)	EA	1	1	2-2	-
---	P---	C---	6650-871-2970	CASE, TELESCOPE M164 (for telescope) 8270828 (19200)	EA	1	1	2-2	-
---	P---	C---		TELESCOPE, OBSERVATION M49 7578445 (19200)	EA	1	1	1-1	-
---	P---	C---	1240-654-3811	TRIPOD M15 6543811 (19200)	EA	1	1	2-1	-
				ARMY TECHNICAL MANUAL TM 9-6650-212-12			1		

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General.

This Maintenance Allocation Chart designates overall responsibility for the performance functions on the identified end item or component. The implementation of field maintenance tasks upon this end item or component will be consistent with the assigned maintenance operations.

C-2. Maintenance Functions.

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine serviceability of an item by comparing its physical, mechanical and electrical characteristics with established standards.

b. Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

c. Service. To clean, to preserve, to charge and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

d. Adjust. To rectify to the extent necessary to bring into proper operating range.

e. Align. To adjust specified variable elements of an item to bring to optimum performance.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

g. Install. To set up for use in an operational environment such as an emplacement, site, or vehicle.

h. Replace. To replace unserviceable items with serviceable like items.

i. Repair. Those maintenance operations necessary to restore an item to serviceable condition through correction of material damage or a specific failure. Repair may be accomplished at each category of maintenance.

j. Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

k. Rebuild. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

l. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

C-3. Explanation of Columns.

Listed below is an explanation of the columns shown in the maintenance allocation chart:

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, Functional Group. Column 2 lists the noun names of components, assemblies, subassemblies and modules on which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the lowest level at which that particular maintenance function is to be performed.

d. Column 4, Tools and Equipment. This column shall be used to specify, by code, those tools and test equipment required to perform the designated function.

e. Column 5, Remarks. Self-explanatory.

Section II. MAINTENANCE ASSIGNMENT

Telescope, Observation M49 W/E

(1) Group Number	(2) Functional Group	(3) Maintenance Function											(4) Tools and Equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
1.0	Telescope, Observation M49	C	F	C	F	--	--	--	F	O*	--	--		*Organizational repair limited to replacement of protective eyepiece cover cap and objective cover only.
2.0	Tripod M15	C	F	C	F	--	--	--	F	--	--	--		
2.1	Case, Telescope M164 (for Telescope)	C	--	C	--	--	--	--	O	--	--	--		
2.2	Case, Carrying M12A1 (for Tripod)	C	--	C	--	--	--	--	O	--	--	--		

LEGEND: C—Operator/crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

By order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

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